

## Product Specification

### 4.25Gbps 850nm PIN + Preamp, LC ROSA

#### HFD3180-203

#### PRODUCT FEATURES

- LC ROSA
- High performance GaAs PIN photodiode with separate transimpedance amplifier
- Low electrical parasitic
- TO46 package
- Data rates from 155Mbps to 4.25Gbps
- A separate detector bias pin which can be used for receive power monitoring
- Low bias currents and voltages



The HFD3180-203 use a high-performance GaAs PIN photo-detector packaged with a transimpedance amplifier designed to meet performance requirements for data rates up to 4.25Gbps data communication over multi-mode optical fiber at 850nm. Applications include Ethernet, Fiber Channel and ATM protocols. The optical assembly is designed to interface either 50mm or 62.5mm multi-mode fiber.

The HFD3180-203 is designed to be paired with Advanced Optical Components VCSEL TOSA products (see data sheets for HFE419x products).

#### PRODUCT SELECTION

Part Number	Description
HFD3180-203	5 pin LC ROSA, with separate PD bias for RSSI

## I. Absolute Maximum Ratings

Parameter	Rating
Storage Temperature	-40 to +85°C
Case Operating Temperature	-40* to +85°C
Lead Solder Temperature	260°C, 10 sec.
Power Supply Voltage	-0.5V to 4V
Incident Optical Power	+3 dBm average, +6 dBm peak

### **Notice**

Stresses greater than those listed under “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress rating only and functional operation of the device at these or any other conditions above those indicated in the operations section for extended periods of time may affect reliability.

### **Notice**

The inherent design of this component causes it to be sensitive to electrostatic discharge (ESD). To prevent ESD-induced damage and/or degradation to equipment, take normal ESD precautions when handling this product

## II. Electro-Optical Characteristics

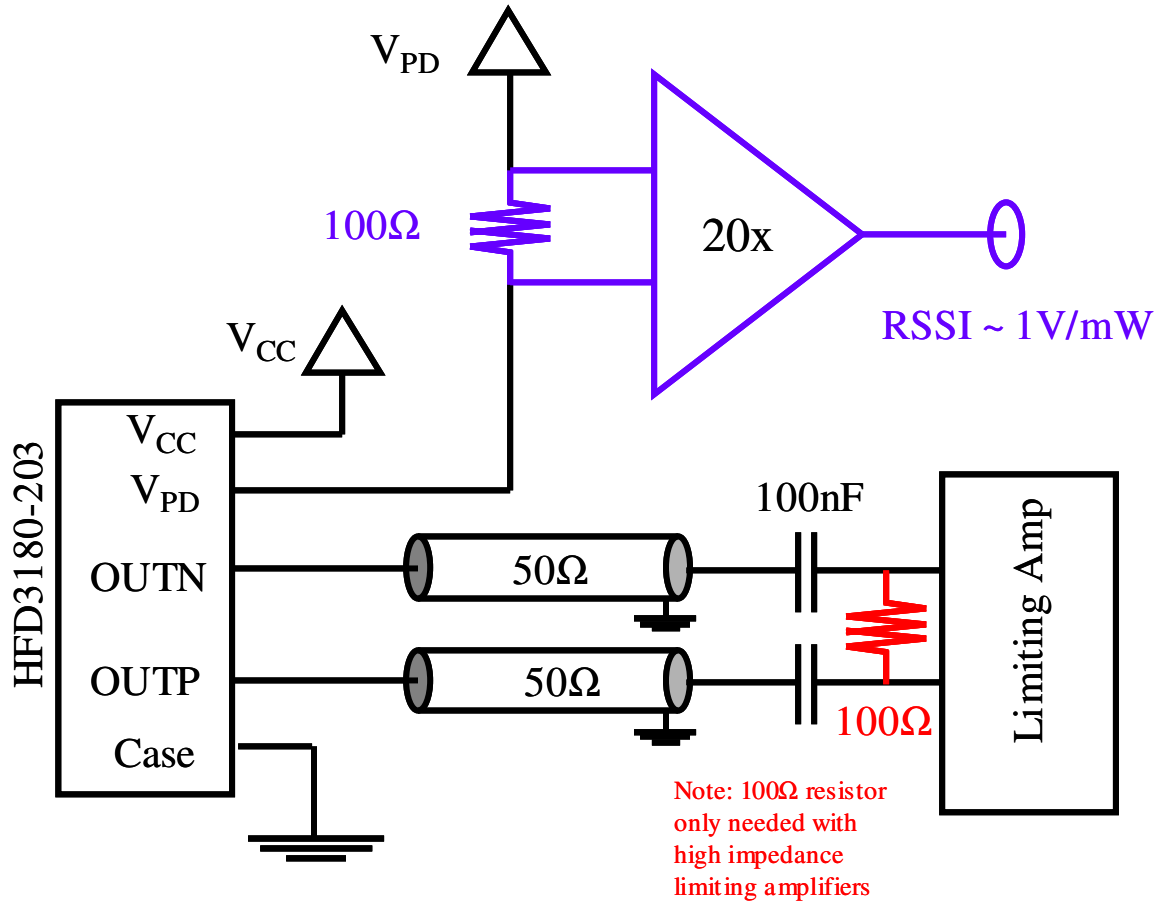
3.0V < V<sub>cc</sub> < 3.6V, AC coupled to 50Ω (100Ω differential), -40°C < T < 85°C unless otherwise specified

Parameters	Test Condition	Symbol	Min.	Typ.	Max.	Units	Notes
Data Rate		DR	0.15		4.25	Gbps	
Supply Voltage			3.0	3.3	3.6	V	
Supply Current	P <sub>R</sub> = 0μW, R <sub>L</sub> = 50Ω AC coupled	I <sub>CC</sub>		30	45	mA	1
Optical Return Loss	P <sub>R</sub> = -12dBm	ORL	12			dB	1
Input Optical Wavelength	0°C to 70°C	λ <sub>p</sub>	770	850	870	nm	
Maximum Average Input Power before Overload		P <sub>MAX</sub>	0	+3		dBm	
Differential Output Voltage Swing	P <sub>R,OMA</sub> = -12Bm, AC Coupled to R <sub>L</sub> = 50Ω	V <sub>o(pk-pk)</sub>	100	150	220	mV	1,2
Differential Transimpedance	P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω	T	1500	2500	3500	V/W	1,2
-3dB Optical/Electrical Bandwidth	P <sub>R,OMA</sub> = -12dBm	BW	2		4	GHz	1,2,3
Low Frequency -3dB Cutoff	P <sub>R,OMA</sub> = -12dBm	BW <sub>LF</sub>			10	KHz	1,2,3
Output Impedance		Z <sub>OUT</sub>	42	50	58	Ω	
Output Return Loss	F < 3GHz	S <sub>22</sub>	8	12		dB	
RMS Input Referred Noise Equivalent Power	3.2GHz, 4-pole BT Filter, P <sub>R</sub> = 0uW (Dark), BER 10 <sup>-12</sup>	NEP			20	μW, OMA	4
Sensitivity, OMA	DR = 1.0625, 1.25Gbps	S		-20	-17	dBm	5
	DR = 2.125, 2.5Gbps			-19	-16		
	DR = 3.125Gbps			-18	-16		
	DR = 4.25Gbps			-18	-15.5		
Stressed Sensitivity, OMA	DR = 1.0625, 1.25Gbps	S <sub>Stressed</sub>		-17	-14	dBm	5,6
	DR = 2.125, 2.5Gbps			-16	-13		
	DR = 3.125Gbps			-14	-11		
	DR = 4.25Gbps			-14	-10.5		
Rise/Fall Time	P <sub>R,OMA</sub> = -12dBm, (20%-80%)	T <sub>R</sub> /T <sub>F</sub>		80	120	ps	2,7
Pulse Width Distortion		PWD			5	%	
Power Supply Rejection Ratio	P <sub>R</sub> = 0μW (Dark), 5MHz < F < 2GHz	PSRR	20			dB	1,8
Monitor Current Slope	P <sub>R</sub> = -12dBm	I <sub>MON</sub>	0.45	0.5	0.55	A/W	9
Monitor Current Offset	P <sub>R</sub> = 0mW	I <sub>OFFSET</sub>			10	nA	
PD Bias Voltage		PD <sub>BIAS</sub>	V <sub>cc</sub> -1	V <sub>cc</sub>	V <sub>cc</sub> +0.5	V	13
Group Delay	P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω 2MHz < F < 2GHz	Delay	-50		50	ps	10
Deterministic Jitter	P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω	DJ <sub>TIA</sub>		30	40	ps	11
Random Jitter	P <sub>R,OMA</sub> = -12dBm, AC Coupled to R <sub>L</sub> = 50Ω	RJ <sub>TIA</sub>		3	5	ps	12

Notes:

1.  $P_R$  is the average optical power at the fiber face.
2.  $P_{R,OMA}$  is the peak to peak optical power at the fiber face (Optical Modulation Amplitude)
 
$$P_{R,OMA} \equiv \frac{2P_R(ER-1)}{ER+1}$$
 where ER is the extinction ratio (linear) of the optical source.
3. Bandwidth and Low Frequency Cutoff are measured with a small signal sinusoidal light source with -12dBm average power
4. RMS input referred optical noise equivalent power is obtained by measuring the RMS output noise into a 3200 MHz, 4-pole Bessel-Thompson filter then dividing by the responsivity. A scaling factor of 14 is used to predict a BER of  $10^{-12}$ .
5. Sensitivity is measured with an optical source with an extinction ratio of 3dB.
6. Stressed receiver sensitivity is measured with 3.5dB vertical eye closure (intersymbol interference) and with 0.3UI of jitter added. The measurement technique is defined in IEEE 802.3ae.
7. Rise/Fall times are corrected for optical source Rise/Fall times.
 
$$T_{TIA}^2 = T_{MEASURED}^2 - T_{OPTICAL}^2$$
8. Value shown is with no external power supply filtering.
9. The monitor current slope is measured as the current into the PD<sub>BIAS</sub> connection.
10. Group delay is a sensitive measurement to package interface, and includes the effects of PD, TIA and package. Measurement is made with TO leads as short as possible.
11.  $DJ_{TIA}$  is specified as contributed DJ by the TIA, obtained from
 
$$DJ_{TIA}^2 = DJ_{TOTAL}^2 - DJ_{OPTICAL}^2$$
12.  $RJ_{TIA}$  is specified as contributed DJ by the TIA, obtained from
 
$$RJ_{TIA}^2 = RJ_{TOTAL}^2 - RJ_{OPTICAL}^2$$
13. If external bias voltage is applied to Vpd while Vcc is externally unbiased, internal biasing of the TIA will occur, resulting in erroneous RSSI current.

**III. Interface configuration**

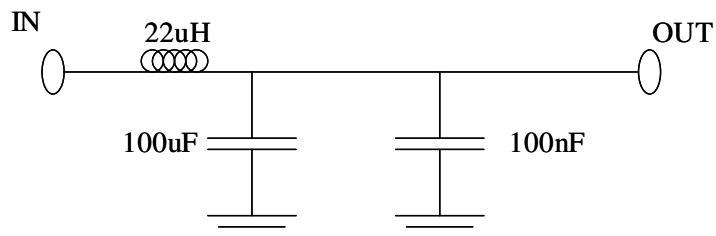


**Optional RSSI implementation is shown in blue.**

**Optional 100Ω differential termination for high impedance limiting amplifiers is shown in red.**

Recommended bias filter network

**Note, better performance will be obtained if a ferrite bead is used in place of the inductor.**





**VI. Revision History**

<b>Revision</b>	<b>Date</b>	<b>Description</b>
B00	8/12/2014	• Changed to Finisar Format

**VII. For More Information**

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